

CHAPTER 24

MARKING GUIDELINES

Marking trees to cut or leave during harvesting or thinning operations is a silvicultural technique frequently utilized for the management of both uneven-aged and even-aged forests. In the marking operation the forest manager designates trees for removal or retention to accomplish one or more objectives. Management objectives at the stand and/or landscape level may include: timber production, unique features considerations, habitat for specific animal or plant species or communities, aesthetic, and recreational values and soil and water protection.

Stand management marking guidelines should be developed according to management objectives. Objectives should be recorded and discussed with marking crew before field marking operations are initiated. Guidelines could include:

- Purpose of the cut (could be several objectives)
- Preferred tree species or mix
- Type of thinning or regeneration cut
- Target basal area (by size class)
- Target crown closure
- Number and size of canopy gaps/acre
- Type (timber, wildlife, aesthetic, water quality) of crop tree to release;
- Number of crop trees to release/acre
- Specific leave or reserve trees (species diversity)
- Special considerations

Written stand management objectives, marking guidelines, results and evaluations are valuable information which should be filed as an historical reference for the next land manager.

Crop tree management is an important part of the marking operation. For most objectives, the focus will be on which trees will be managed or retained until the next entry, and beyond. Crop tree selection strongly influences which trees should be removed during the current operation. Crop trees may be chosen to meet most management objectives as illustrated in Tables 24.3 through 24.6. For more information see Crop Tree Management in Eastern Hardwoods, NA-TP-19-93, USDA-FS, Northeastern Area State and Private Forestry.

Some basic guidelines for marking towards single objectives are listed below. Most marking will combine objectives from part or all of the individual sections, along with other ecological objectives.

Timber Considerations

Management for timber production focuses on crop trees, residual basal area and removal of high risk and/or low vigor trees, and bole quality.

Tables [24.1](#) and [24.2](#) illustrate a system for evaluating risk and vigor primarily for timber management considerations. Trees that are surplus to target stocking levels identified in species or type chapters can be marked according to the priorities in the tables. Additional crop tree marking criteria are found in Table [24.3](#). With some flexibility the two systems can be integrated.

Species selection may be an important consideration related to economics and other forest management objectives. Species selection should be guided by the habitat classification system, as well as stand and landscape objectives.

Table 24.1 Tree risk and vigor grading rules

	Good Growing Stock	Fair Growing Stock	Poor Growing Stock	Cull
Tree Risk Qualifications	Risk 1	Risk 2	Risk 3	Risk 4
Risk of mortality after moderate partial cuts	Good mechanical stability; roots firm; lower and upper bole sound; all large, high crotches strong; no windfall or main stem breakage anticipated.	Average mechanical stability; roots firm; moderate rot in lower trunk has no particular effect on risk of loss; large, high crotches strong; loss of tree not likely within 10 to 15 years.	Poor mechanical stability; roots sprung; large, high, weak crotches; weak, butter-churn butts; excessive dieback, epidemic disease or insect damage; loss of tree likely within 5 to 10 years.	Cull
Tree Vigor Qualifications	Vigor 1	Vigor 2	Vigor 3	Vigor 4
Crown Class	Head dominant; dominant; co-dominant.	Dominant; co-dominant; intermediate; free to grow if overtopped.	Suppressed; suppressed not free to grow are always Vigor 3.	Cull
Crown Size	In hardwoods, a full crown concentrically. In conifers, a good crown-length ratio.	In hardwoods, a 1/2-3/4 full crown concentrically. In conifers, a fair to good crown-length ratio.	In hardwoods, a crown less than half full concentrically. In conifers, a poor crown-length ratio.	Cull
Crown Density and Leaf Condition	Good silhouette, healthy leaf; occasional dead branch in outer crown; permits natural pruning.	Fair silhouette; fair leaf condition; some dead branches in outer crown; large branch stubs on upper bole.	Poor silhouette; leaves small, yellowing; considerable dieback and many branch stubs on upper and middle bole.	Cull
Bole length and Form	Useable length commensurate with site; DBH-length ratio good; no usable length stoppers.	Useable length fairly commensurate with site; DBH-length ratio fair; usable length stopper on upper bole.	Useable length far short of the average for the site; DBH-length ratio poor; trees permanently sub-merchantable in length are always Vigor 3 or worse.	Cull
Rot and decay	Cull loss never exceeds 10%; slight crook or sweep will cut out.	Cull loss never exceeds 20%; moderate crook or sweep will not cut out.	Cull loss never exceeds 60%; heavy crook or sweep will not cut out.	Cull

Table 24.2 Marking Priority Guide

Risk	Vigor		
	1	2	3
1	10th	9th	6th
2	8th	7th	5th
3	3rd	2nd	1st
Cull	4th		

RISK refers to the mechanical stability of the tree. It is the estimate of chance or degree of probable loss within the next cutting cycle.

VIGOR is the measure of growth potential of an individual tree. It describes the tree, and its ability to grow at a rapid rate and increase net volume.

To properly apply these marking guides, classify the tree first by risk and then by vigor (assign each 1, 2 or 3, from lowest to highest) using the "Tree Risk and Vigor Grading Rules" (Table [24.1](#)). The next step is to determine how the tree ranks in terms of cutting priority by referring to the above "Marking Priority Guide."

A tree classified as Risk 2 and Vigor 3 would be ranked 5th in marking priority. A Risk 3/Vigor 3 tree would receive the highest marking priority whereas as a Risk 1/Vigor 1 tree would receive the lowest marking priority. Risk 3 trees receive a higher priority than cull trees because of the potential for higher value loss.

Frequent initial reference to this tree classification system will quickly establish familiarity with the system and proper marking habits.

Table 24.3 Timber Crop Tree Selection Criteria

<ul style="list-style-type: none"> • Dominant/codominant trees (at least 25 feet tall) <ul style="list-style-type: none"> - Healthy crown; large in relation to dbh - No dead branches in upper crown - Either low-origin stump sprouts (less than six inches at groundline) or seedling-origin stems are acceptable - U-shaped connections are acceptable; avoid V-shaped connections
<ul style="list-style-type: none"> • High-quality trees <ul style="list-style-type: none"> - Butt-log potential of Grade 1 or 2 - No epicormic branches (living or dead) on butt log - No high-risk trees (leaners, splitting forks, etc.)
<ul style="list-style-type: none"> • High-value commercial species
<ul style="list-style-type: none"> • Expected longevity of 20+ years
<ul style="list-style-type: none"> • Species well-adapted to the site

Wildlife Considerations

While planning marking of an area to be cut, note specific trees that have high value for wildlife. Reserve sufficient numbers of these trees until economic or ecological considerations alter their relative value within the stand and landscape. Reserve trees can provide important structure (standing or as down woody debris) or function when managing an ecosystem. Re-evaluate reserve trees periodically. Marking can be considered when their economic or other value is about to be lost, when they begin to seriously damage forest regeneration or timber production, or when other values shift.

In southern Wisconsin black cherry is a good example of a reserve tree; large, vigorous specimens are rare and their fruit is eaten by many birds and mammals. In the north, large, tall white pines or hemlock groves are often reserved. Any current or future den or mast-producing tree is a good candidate to reserve. If a few very large trees remain from previous harvests, reserving these trees often meets den, snag and species diversity objectives.

The "wolf tree" is one of the best reserve trees. Though reserving wolf trees may mean sacrificing some timber production, they are among the best mast and den producers. Wolf trees in southern Wisconsin may indicate former savanna conditions.

To minimize the impact of timber harvest on cavity-dwelling wildlife, it is important that a reasonable number of appropriate snag and den trees be left after harvest. For most forest ecosystems the current understanding of the biology of cavity-using wildlife is too limited to employ species by species estimates of snag requirements. But in the absence of necessary information, using a guideline of two to four large snags per acre as a rule of thumb is the best strategy. Within the USA, biologists studying forest types from nearly every region have consistently arrived at similar recommendations for snag and den tree densities.

The long-term nature of snag and den tree availability must also be considered. To maintain an appropriate number of snags, the recruitment rate for snags must balance the mortality rate. One solution is to leave trees with poor form and low economic value to serve as future snag trees. Cavity requirements might sometimes be easier attained with living trees since the number of residual snags is so unpredictable. Because one can assume that a portion of those trees set aside to become the second generation of snag trees will fall down before they die, it is advisable to leave more than will ultimately be needed as snags.

In addition to selecting trees with poor form as future snag trees, it is sensible to choose trees that are infected with heart rot. These trees will be of low value and may already have cavities. Diseased trees can be identified by the presence of conks of heart rot fungi; wounds such as broken branch stubs and fire scars; dead portions of the crown; and woodpecker holes.

Guidance for more specific snag and den tree management prescriptions can be found in a *"A Landowner's Guide to Woodland and Wildlife Management"* (University of Wisconsin-Extension, Publication Number 193578). This publication was developed to help the private landowner better manage woodlands for wildlife. It is a good source of information for specific snag requirements of some of our most common cavity-using birds and provides other information useful when managing mature forests for wildlife.

When not reserved for wildlife or other reasons, cull trees may be marked and be removed the same as merchantable trees. Removal of cull trees will not be left to the discretion of the logger.

See Table [24.4](#) for a description of a wildlife crop tree.

Table 24.4 Wildlife Crop Tree Selection Criteria

Mast-producing species:
<ul style="list-style-type: none"> • Dominant/codominant trees <ul style="list-style-type: none"> - Healthy crown; large in relation to dbh - A few dead, upper-crown branches are acceptable - Stump-sprout or seedling-origin stems are acceptable
<ul style="list-style-type: none"> • Hard-mast producers preferred over soft-mast producers; strive for species variety
<ul style="list-style-type: none"> • Expected longevity of 20+ years
<ul style="list-style-type: none"> • Cavities and large, broken branches are acceptable
Cavity trees*:
<ul style="list-style-type: none"> • Trees of any species, size class, and crown position are acceptable
<ul style="list-style-type: none"> • Dead, upper-crown branches and cavities in the main bole are acceptable
<ul style="list-style-type: none"> • Expected longevity of tree isn't important
*If a cavity tree is also a mast producer, release it. Otherwise, it need not be released.

Aesthetic Considerations

Aesthetics involves not only individual marking decisions but long term planning and design. The Silviculture and Forest Aesthetics Handbook should be referenced when designing aesthetic considerations for forest management application.

See Table [24.5](#) for a description of crop trees for aesthetic management.

Soil and Water Quality Considerations

Table [24.6](#) indicates some of the considerations when choosing a crop tree with water quality as a management objective. Also see the [Best Management Practices \(BMP\) Manual](#).

Ecological Resources Considerations

Landscape diversity marking or planning decisions are based on considerations not driven by timber production guidelines. Ecological considerations may include landscape level planning, aesthetic management, habitat management, and biodiversity decisions based on plant or animal habitat needs. Marking decisions may modify the structure and/or composition of the forest or landscape at the local or regional level and may have both short and long term implications. The effects of past timber harvest, land clearing, fire control, wildlife populations may alter marking decisions. Marking objectives should be established as part of the timber sale planning process, and will likely relate to property master plans, the Land Classification System, and the Natural Heritage Inventory.

Additional References

Crop Tree Management in Eastern Hardwoods; Perkey, Arlyn and Wilkins, Brenda; USDA Northeastern Area State and Private Forestry; NA-TP-19-93.

Best Management Practices for Soil and Water Quality; Holoday, Steve; WI Department of Natural Resources; 1995.

Forest Aesthetics Management Considerations and Techniques; Sloan, Kenneth; WI Department of Natural Resources; Publ. #FR-039-86.

Table 24.5 Aesthetic Crop Tree Selection Criteria

<ul style="list-style-type: none"> • Species that produce attractive flowers or colorful foliage <ul style="list-style-type: none"> - Healthy crowns; large relative to dbh - A few dead, upper-crown branches are acceptable - Stump-sprout or seedling-origin stems are acceptable - Understory trees acceptable if release is not high risk
<ul style="list-style-type: none"> • Visible from travelways and adjacent to streams, when opportunity exists
<ul style="list-style-type: none"> • In many cases, expected longevity of 20+ years
<ul style="list-style-type: none"> • Unique trees (old pasture trees with spreading branches, unusually shaped trees, trees with attractive bark characteristics, etc.)

Table 24.6 Water Quality Crop Tree Selection Criteria

<ul style="list-style-type: none"> • Dominant/codominant trees <ul style="list-style-type: none"> - Healthy crown; large in relation to dbh - A few dead, upper-crown branches are acceptable - Stump-sprout or seedling-origin stems are acceptable
<ul style="list-style-type: none"> • Expected longevity of 20+ years
<ul style="list-style-type: none"> • Species that are good nutrient accumulators <ul style="list-style-type: none"> - Young trees - Deciduous trees
<ul style="list-style-type: none"> • Trees tolerant to flooding